Semi-conductor - Metal Transformation in Zn $_{0.84}$Fe$_{0.16}$Se Alloy*	X17C

J. Xu, E. Huang, J. Lin, M. Lee, C. Li (Academia Sinica, Taiwan), W.-C. Chou (Chung Yuan Christian U., Taiwan), C.-M. Lin, (Nat. Chiao Tung U., Taiwan), and J. Hu (NSLS)

Recently we performed high-pressure Raman experiments on ZnSe and $ZnMn_{l-x}Se$ alloys up to 40 GPa. It was found that two high-pressure phases appear sequentially, the Raman spectra and Raman peaks of these high-pressure phases were found up to 40 GPa. Therefore, the penetrating depth of laser beam in such a high pressure 'metallic' phase should be much deeper than that of the normal metals. It will be of great interest to perform their high-pressure X-ray diffraction studies to examine their structures and the equation-of-state at various pressures.

The Zn $_{0.84}$ $Fe_{O.16}$ Se crystal grown by the modified Bridgman method was crashed to the size of 100 μm powder which was used as the starting material. The sample was loaded in the sample hole (250 μm in diameter) of a gasket made of T301 stainless steel in a Mao-Bell type diamond anvil cell (DAC). All of our (Energy Dispersive X-ray Diffraction - EDXRD) experiments have been carried out in X 17C in NSLS, BNL with the beam size of 50 x 50 μm. Gold was used as the pressure calibrater as well.

The Zn $_{0.84}$ $Fe_{O.16}$ Se has a lattice parameter of 0.5639±O.0001 nm from EDXRD measurement at ambient conditions. The zinc-blend only (B3) phase for (1 11), (200), and (311) peaks below 11.4 GPa. Above 11.4 GPa, these diffraction peaks disappear and an apparent occurs for the rock salt (B 1) phase (200) and (220) peaks up to 21 GPa. The values of Ko and Ko' can be determined by fitting the EOS data to Murnaghan equation as 50.4±1.6, 3.91±1.12, and 80.2±l. 1, 3.641±0.55, respectively for B3 and B1 phases. The transition pressure is 11. 4 GPa in good agreement with previous Raman study. Another expected phase transition around 4.0 GPa detected by our previous Raman study has not show-up in our experiments. It will be great of interest to verify this transition by other structural determination method in the future. *Support received from the National Science Council, Taipei, NSC-86-2613-M-213-015 and NSC-86-2116-M-001-021.